Contact ISPT: nathan.bowden@ispt.eu

COSMOS (OSNF membranes on low cost supports)

Hybrid silica and polymeric membranes will be applied on low cost high quality tubular ceramic supports as organic solvent NF membranes: cut-off value of 200 g/mol and application up to 140°C.

Project number BL-30-01

Project leader(s) Henk van Veen (ECN part of TNO)

E-mail henk.vanveen@tno.nl

Partners CoorsTek, ECN part of TNO, ISPT, Shell, Univ. Twente

Budget 988 k€

Duration 1 October 2017 till 31 March 2020

Incentive

- By organic solvent nanofiltration (OSNF) 40% more efficient separation processes are possible with energy savings of 2-8 PJ/year in the Netherlands.
- there is a need for stable membranes with a retention of 200 Dalton applicable at 140°C.
- Good quality hollow-fibre ceramic supports are available at low costs and they will be used as support for hybrid silica and polymeric NF membrane layers.

Objective

Scale-up hybrid silica and polymeric OSNF membranes to 0.1 m^2 using low cost, high quality ceramic supports (TRL 4 to 6).

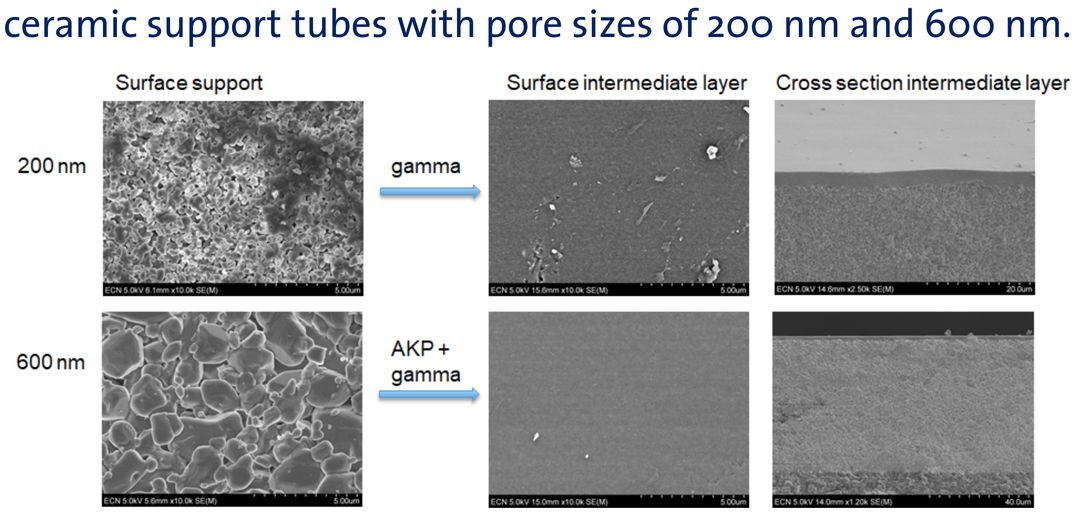
Approach

- Make stable OSNF membranes on reliable low cost ceramic supports with tuned retention for improved separation.
- Specific application is the separation of small molecules from solvents at high temperature in the process industry.
- Develop the membrane manufacturing technology to 0.1 m^2 with straight forward scale up to modules of 4-5 m^2 area.
- Set-up a membrane material production roadmap, scale up + implementation clarified and described.

Results

Support development

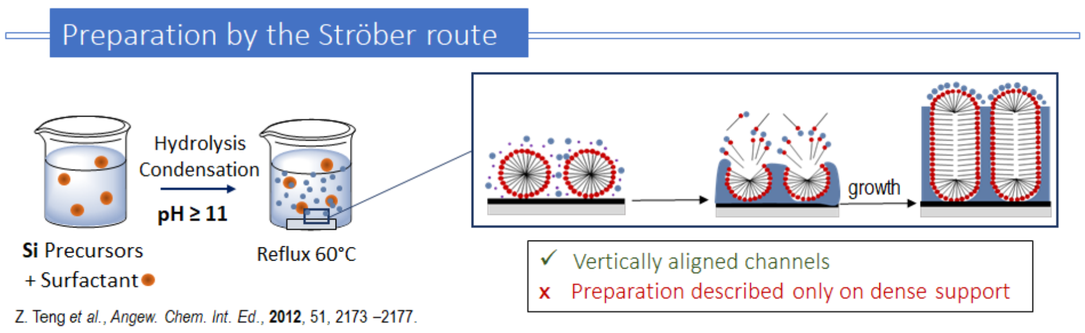
Intermediate layers with good quality applied on outside of ceramic support tubes with pore sizes of 200 nm and 600 nm.

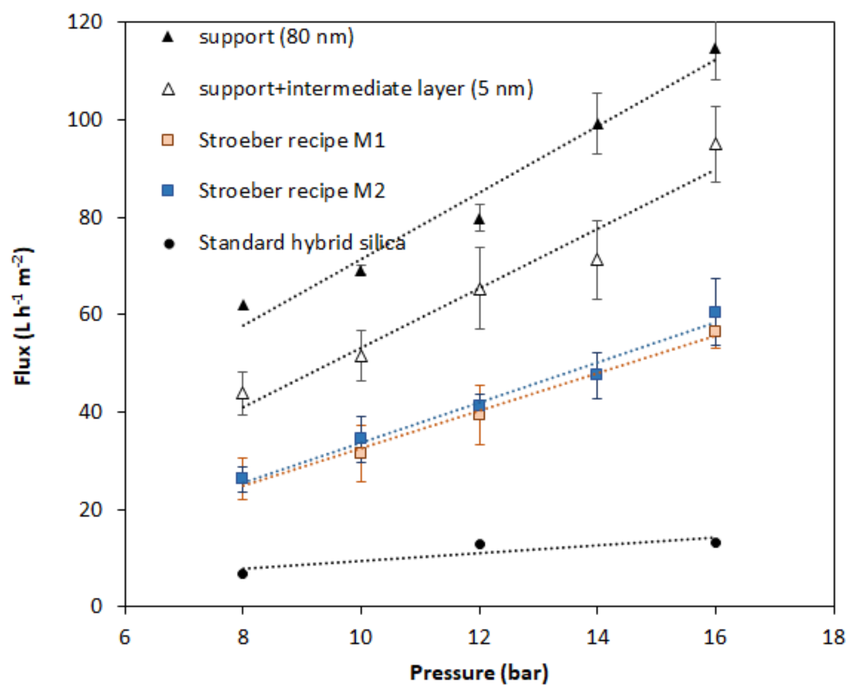


Membrane layers

Standard hybrid silica membrane: retention of > 95% for 330 Dalton molecule with a permeance of 2 kg/m^2hbar in toluene at 100°C.

A new (Ströber) synthesis route leads to much higher water permeances than the standard hybrid silica membrane, see the graph below. Cut-off value = 2200 Dalton.





Next steps

- Apply hybrid silica and Ströber route membranes on the inside of support tubes.
- Test in model mixtures with 200 Dalton and 800 Dalton marker molecules in organic solvents.
- Techno-economic feasibility study and road mapping.

Institute for Sustainable Process Technology

TOPSECTOR ENERGIE
Empowering the new economy

This project is co-funded with subsidy from the Topsector Energy by the Ministry of Economic Affairs and Climate Policy. RVO project reference number: TEEI117016.